SECTION 1100 - GRADING

1101 SCOPE. This section covers the performance of all the work and appurtenances required for grading the project in coordination with all previous work performed at the locations shown on the contract drawings.

1102 MATERIALS AND DEFINITIONS.

A. Grading. Grading shall be defined as meaning the performance of all excavation, embankment and backfill in connection with the construction of all improvements.

B. Excavation. Excavation is defined as the removal of materials from the construction area to the lines and grades as shown on the contract drawings.

Unless otherwise provided for in the Special Conditions and included in the proposal, all excavation shall be unclassified excavation and the contractor shall satisfactorily remove and dispose of all materials encountered regardless of their nature.

When provided for in the Special Conditions and included in the proposal, the excavation may be classified according to the following categories.

1. Common Excavation. Suitable materials shall include all earth free of rock, sod, weeds, roots and other debris, and containing the soil characteristics and moisture content to obtain the required compaction.

2. Rock Excavation. Rock excavation will be so classified when sandstone, limestone, blue shale or other similar material is encountered and, in the opinion of the engineer, requires drilling or blasting to remove the material.

C. Embankment. Embankment is defined as the placing and compacting of material in the construction area to the lines and grades as shown on the contract drawings.

Material suitable for use as embankment shall be entirely imperishable and shall be determined as acceptable by the engineer.

Materials suitable for earth embankment shall be free of waste material, contain less than ten (10) percent by volume of rock and gravel, and contain no particles having a dimension greater than three (3) inches.

Materials suitable for rock embankment shall be free of waste material and contain ten (10) percent or greater by volume of rock or gravel containing particles ranging in size from a minimum dimension of three inches (3") to a maximum of twenty-four inches (24").

Material not suitable for use as embankment material shall include, but shall not be limited to, frozen material, organic material, topsoil, rubbish, rock, broken concrete, brick, asphaltic concrete, and other debris and soil not containing the characteristics and moisture content to obtain the required compaction.

D. Structures. Structures, as used herein, refers to bridges, basins, street drainage structures, headwalls, retaining walls, and similar construction.

1103 CONSTRUCTION - GENERAL. During excavation and embankment grading operations, the work shall be performed in a manner and sequence that will provide drainage at all times. Soft spots or areas that develop during grading operations shall be removed, the area then backfilled with suitable material and compacted to obtain the required density. No additional payment will be made to the contractor for this work.

1104 EXCAVATION - GRADING. Excavation of every character and of whatever materials encountered within the construction limits shall be performed to the lines and grades indicated on the contract drawings.

All suitable material removed by excavation shall be used as far as practicable in the formation of embankments or elsewhere when and as directed by the engineer. It shall be the responsibility of the contractor to handle excavation in any manner he sees fit, provided that suitable materials will be available when required. No additional compensation will be allowed for any special sequence of excavating or placing of such materials or any re-handling of materials.

Excavation materials in excess of the amount needed to complete the grading shall be considered as waste material which shall be removed from the site by and at the expense of the contractor.

Any additional fill material required which is not available from excavation within the construction limits shall be supplied by the contractor at no expense to the owner unless provided for in the proposal and Special Conditions. All such material brought to the site and incorporated in the work shall be subject to the approval of the engineer.

In the event during grading operations materials are encountered below grade or otherwise which are determined as being unsuitable or unstable by the engineer or his representative they shall be removed to the depth required to reach stable material. The area involved shall then be backfilled with suitable material as determined by the engineer and compacted to obtain the required density.

All roadway excavation in rock (shale, sandstone, limestone) shall be undercut no less than 12" for the full width of the roadway and backfilled with suitable soil or granular material. Undercut shall be unclassified excavation.

1105 EMBANKMENT--GRADING. The embankments shall be formed with suitable materials, as herein defined, procured from excavations made on the project site, or from borrow pits as required to complete the grading work.

Where embankments, regardless of height, are placed against hillsides or existing embankments, either of which have a slope steeper than one (1) vertical to six (6) horizontal, the existing slope shall be benched or stepped in approximately eighteen-inch (18") rises as the new fill is brought up in eight-inch (8") lifts. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Materials thus cut out shall be recompacted to the required density along with the new embankment material. Material cut out, bladed into place, and compacted shall not be measured and paid for directly but will be considered as incidental work.

The existing surface upon which embankment material is to be placed shall have all unstable and unsuitable material, such as topsoil, peat, mulch, coal seams, disintegrated shale, rubbish, logs or stumps, and unconfined saturated soils, removed to the depths shown before starting the embankment work.

Where embankments two feet (2') or less in depth are to be placed on areas covered by existing pavement, the existing pavement shall be removed and the cleared ground surface shall be compacted at optimum moisture to the specified density. Where embankments greater than two (2) feet in depth are to be placed on areas covered by existing pavement, the existing pavement shall be broken into pieces not larger than twenty-four inches (24") maximum dimension, left in place and the embankment started thereon.

Earth embankment shall be placed in successive horizontal layers distributed uniformly over the full width of the embankment area. Each layer of material shall not exceed eight inches (8") in thickness (loose measurement) and shall be compacted to the density specified in paragraph 1106 before the next layer is placed thereon. As the compaction of each layer progresses, continuous blading will be required to level the surface and to ensure uniform compaction. Embankment construction shall not be performed when material contains frost, is frozen, or a blanket of snow prevents proper compaction.

Successive horizontal layers of rock embankment not exceeding two (2) feet in depth, shall be made by placing larger stones uniformly over the embankment area. Small stone fragments, sand, earth, or gravel shall be placed between the larger stones to fill all voids. Each layer shall be thoroughly compacted before the next layer is placed.

Large rocks shall be withheld from the top one foot or more of the embankment and only crushed stone or earth used in this layer. The crushed stone shall be well graded to form a dense mass when compacted and maintained adequate cohesive and interlocking characteristics.

1106 EMBANKMENT--BACKFILL AND COMPACTION. Each successive lift of backfill material shall be rolled with a tamping or sheepsfoot roller, except as provided below for sand and gravel, making a sufficient number of trips over the entire surface to compact all material thoroughly and uniformly. Compaction shall be continued until 95% of maximum density is obtained at the optimum moisture content as determined by ASTM D698.

Sand and gravel which cannot be compacted satisfactorily with a sheepsfoot roller shall be rolled with a pneumatic-tired roller. Each lift shall be rolled until no further consolidation is evident.

All the work involved in either adding moisture to, or removing moisture from embankment materials shall be considered incidental to the completion of the grading operation.

Backfilling behind curb or curb and gutter shall be done within seven (7) days after being laid unless otherwise approved by the engineer. All fill material placed behind the curb and gutter beneath and either side of sidewalks within the right-of-way shall be brought to 95% of maximum density at the optimum moisture content as determined by ASTM D698. The material used to fill the void behind curb or curb and gutter shall be free of rock and debris and shall be of a type that will leave no voids to pocket water and that will self-compact. Unless otherwise shown on the contract drawings, the finish grading from the back of the curb to the right-of-way line and/or utility easement line or construction easement line shall be performed to provide a smooth transition between existing yard grades at the right-of-way line and/or easement line to the curb so that positive drainage will exist.

The top portion of the backfill within right-of-way areas shall be finished with at least twelve (12) inches of topsoil corresponding to, or better than, that underlying adjoining sodded areas. Topsoil shall be approved by the engineer prior to placement, and unless otherwise directed, shall be material previously excavated and stockpiled for the purpose during excavating and grading operations.

Grades on areas to receive topsoil shall be established and maintained as a part of the grading operations. Immediately prior to dumping and spreading topsoil, the surface shall be loosened by discing or scarifying to a depth of two (2) inches to permit bonding of the topsoil to the underlying surface.

1107 STRUCTURE BACKFILL. Backfill around and outside of structures shall be deposited in layers not to exceed eight (8) inches in uncompacted thickness and brought to 95% of maximum density at optimum moisture content as determined by ASTM D698. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted.

Material for structure backfill shall be composed of earth only and shall contain no organic materials, broken concrete, stones, trash, or debris of any kind.

No tamped, rolled, or otherwise mechanically compacted backfill shall be deposited or compacted in water.

All backfill material shall consist of loose, earth having a moisture content such that maximum density of the compacted soil will be obtained. Moisture content shall be distributed uniformly and water for correction of moisture content shall be added sufficiently in advance that proper moisture distribution and compaction will be obtained.

Backfill around and outside of structures that will ultimately lie under proposed pavements shall be compacted to the requirements of Section 1205 "*Compaction Requirements*".

1108 SHEETING AND SHORING. Except where banks are cut back on a stable slope, excavation for structures shall be properly and substantially sheeted, braced, and shored, as necessary, to prevent caving or sliding, to provide protection for workmen and the work, and to provide protection for existing structures and facilities. Sheeting, bracing, and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure and shall be rigid, maintaining shape and position under all circumstances. Sheeting, bracing and shoring shall be considered subsidiary to excavation.

1109 FINAL GRADING. After other outside work has been finished, and backfilling and embankments completed and settled, all areas on the site of the work which are to be graded shall be brought to grade at the indicated elevations, slopes, and contours, including shoulder, berm, and sidewalk spaces. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and conforming to the lines and grades shown on the plans. The contractor shall repair any damaged surface and shall not use any equipment that will leave a marred surface.

1110 CLEANUP. Cleanup shall follow the work progressively and final cleanup shall follow immediately behind the finishing. The contractor shall remove from the site of the work all equipment, tools, and discarded materials, and other construction items. The entire right-of-way or easement shall be left in a finished and neat condition. Cleanup shall be considered a subsidiary obligation of the grading work.

In the event the contractor does not promptly comply with the terms of such instructions, the city may have the defective work corrected or the rejected work removed and replaced and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by the contractor. The contractor will also bear the expenses of repairing work of others destroyed or damaged by his correction, removal or replacement of defective work.

1111 SETTLEMENT. The contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within two years after final completion of the contract under which the work was performed.

The contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the engineer.

1112 TEMPORARY SURFACING. If during construction activities it is deemed necessary to provide ingress and egress to the public by placement of temporary surfacing, the contractor shall do so at the direction of the city engineer or his authorized representative. Temporary surfacing shall meet the requirements of the Kansas Department of Transportation classification CA-5, for aggregates. Larger aggregates (3/4" or 1") may be used if, in the opinion of the city engineer additional stabilization is necessary. Temporary surfacing shall be supplied by the contractor at no expense to the owner unless provided for in the proposal and Special Conditions.